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shell is allowed to remain untouched for some time, as if the animal was trying to acquaint itself with its new surroundings. After one adductor is severed, the valves open, so that the other may be easily reached.

2°. I have often seen the posterior margins of the valves slightly notched, and the epidermis scratched, from the efforts of the muskrat to open the shell.

3°. The shells are never opened by tearing away the hinge-ligament, although this portion is sometimes injured.

4°. During the winter season the shells were deposited, often many bushels, upon the edge of the ice which fringed the shores. This offered an explanation to me for the large quantities of dead shells which I had frequently noticed in certain localities at the bottom of the river.

5°. With the mussels in the muskrat shell-heaps were many flat stones, gathered for the purpose of eating the algae growing upon them.

6°. Among the species eaten by the muskrats of the Alleghany River may be mentioned the following as of the most frequent occurrence: *Unio ligamentinus*, *U. phaseolus*, *U. gracilis*, *U. patulus*, *U. clavus*, *U. crassidens*, *U. occidens*, *U. ovatus*, *U. luteolus*, *U. gibbosus*, *Margaritana rugosa*, *M. marginata*, and *Anodonta edentula*.

CHAS. E. BEECHER.

Albany, N.Y., Feb. 9.

I have been familiar, ever since my boyhood, with the fact that these animals live largely upon the mussels and other shell-fish of our rivers and creeks. It is also well known to duck-hunters, at least in this region of country, that they pick up no inconsiderable portion of their subsistence from dead and wounded birds found by them after the sportsman has abandoned the search. Only last spring I killed a duck in this vicinity which fell out of reach and floated off. Upon recovering it within less than an hour afterwards, on the farther shore of the 'slough,' its breast had already been eaten away by a muskrat; and it is no uncommon occurrence to surprise them at such repasts.

THEO. S. CASE.

Kansas City, Mo., Feb. 9.

If those interested in the carnivorous habits of the muskrat will refer to *Science*, No. 62, they will find there a notice of a discussion upon this subject, which took place before the Biological society of Washington in the spring of 1884. In regard to the fact that piles of *unbroken* *Unio* shells are found near muskrat burrows, it seems to me that there can be but one explanation, and that is the suggestion made at the Biological society, that the shells are gathered by the muskrats, piled up, and left out of water until too weak to keep their shells closed, when the rodent finds it an easy matter to pick out the meat.

RALPH S. TARR.

Cambridge, Mass., Feb. 6.

#### JOHN GWYN JEFFREYS.

THE ranks of English naturalists have met with a serious loss in the death of John Gwyn Jeffreys, LL.D., F.R.S., etc., which took

place suddenly at his residence, Kensington, on the 24th of January.

Dr. Jeffreys was born at Swansea, Jan. 18, 1809, and at the time of his death, with the exception of Sir Richard Owen, was probably the oldest British naturalist. Up to the last he was busily engaged on the investigation of the deep-sea dredgings of the Lightning and Porcupine expeditions; and, only three days before the reception of the news of his death, a copy of a recent paper on the relations of the American and European mollusk faunae was received from him.

Dr. Jeffreys was the descendant of one of the oldest families of Wales, and was called to the bar at Lincoln's Inn. For many years, however, he had retired from practice, and had been devoted to the investigation of the natural history of mollusks, especially those of the British islands, northern Europe, and the adjacent seas. His work on the British mollusca is the standard book of reference on that topic, and his investigations into the fauna of the deep sea were known and appreciated among men of science everywhere.

Dr. Jeffreys, from a lad, had been a student of conchology, devoting his holidays to collecting, and was among the earliest, most energetic, and persistent dredgers of the British seas. In his earlier days he was intimately acquainted with that classical band of British naturalists to whom science owes so much, and who toiled for the most part unappreciated. In later years he was equally active, and participated in the important expeditions of the Lightning, Porcupine, Valorous, etc., and was only prevented by an accident from participation in the voyage of the Challenger. His first important paper was published by the Linnean society in 1828; and since then hardly a year has passed by without contributions from his pen, many of which were printed by the Royal society, of which he was for forty-five years a fellow. The extent and importance of his researches can only be fully appreciated by specialists engaged in similar studies. He was president of the biological section of the British association in

1877, and held the office of high sheriff of Hertfordshire and other important public trusts at various times. He was treasurer of the Geological society for many years, and honorary or corresponding member of many foreign societies.

In scientific matters, Dr. Jeffreys had something of the conservatism natural to a person of his years; but his opinions, however firmly held, were never expressed with bitterness, and his geniality and hospitality bound to him in friendly ties not only scientific men, young and old, but the intelligent and cultured throughout his wide circle of acquaintance. He leaves a son, Mr. Howel Jeffreys, and five daughters, one the wife of Prof. H. N. Moseley of the Challenger expedition. His collection, which for British seas is absolutely unrivalled, possessing many of the actual types of Turton, Alder, and other early British naturalists, and an extremely rich and largely unique North Atlantic and North European series will form one of the treasures of the National museum at Washington, where a portion of it has already been received. W. H. DALL.

#### THE WASHINGTON NATIONAL MONUMENT.

THE history of the undertaking which has resulted in the completion of the Washington monument presents a number of interesting and curious facts; and the construction of the monument itself, by reason of the magnitude of the structure, has involved some problems of considerable engineering importance.

The early history of the monument may be said to date from 1783, when congress resolved to erect, wherever the residence of congress should be established, an equestrian statue of Washington; and in 1795, when it was proposed to build a monument commemorating the American revolution, Major L'Enfant, the designer of the plan by which the city of Washington is laid out, selected, and Gen. Washington himself approved, the site where the finished monument of which we write now stands.

After the failure of these and other similar plans, the next step was taken in 1833, when, under the auspices of the Washington national monument society, the aid of the people of the United States was invoked to raise the sum

required to erect a great national monument, no one to contribute more than one dollar, — a restriction which was removed in 1845. Money came in slowly; but by 1847, \$87,000 had been raised, and it was determined to make a beginning; and, by authority from congress, President Polk deeded the present site to the society. Building was at once commenced, but proceeded slowly; and in 1854 the society had spent \$230,000, and raised the monument to a height of 152 feet above the base.

The original design by Robert Mills included an obelisk faced with white marble, 600 feet high, 55 feet square at the base, and 30 feet square at the top, surrounded at its base by a circular rotunda or colonnade 250 feet in diameter and 100 feet high, in which were to be placed statues of the nation's illustrious dead, with vaults beneath for the reception of their remains.

The base or foundation masonry was about 80 feet square at the bottom, laid at a depth of but eight feet below the surface of the ground, and carried up, in steps of about three feet rise, to a height of 25 feet, where it is 58 feet square. The slight depth to which the foundation was carried was due to the anxiety of the building committee to have something to show for the money expended. It was built of rubble masonry of blue gneiss, the blocks large and of somewhat irregular shapes (nearly as they came from the quarry), laid in a mortar of hydraulic cement and stone lime, the joints and crevices filled and grouted. The shaft of the obelisk was built hollow, with walls 15 feet thick at the base; the well, or hollow interior, being 25 feet square for the whole height then built. The exterior face, to an average depth of sixteen or seventeen inches, was of Maryland marble, usually called alum-stone. The remaining thickness of the walls was of blue-stone rubble backing, not the best construction for a building of such enormous weight.

To ascertain the kind of earth that would be under the monument, a well was dug, some 25 feet deep, in the immediate vicinity of the site, and the earth particularly examined. The material was found very compact, requiring a pick to break it up, and was pronounced suitable for a structure of the kind. At a depth of twenty feet a solid bed of gravel was reached, and, six feet lower, water was struck. Before the first course of marble was laid, bench-marks were located from which to test the settlement of the monument. After building to 126 feet in height above the ground, the chairman of the building committee writes,